

## CLAIMS

What is claimed is:

- 1 1. A method for calculating a level of detail (LOD) value for use during  
2 computer graphics processing, comprising:  
3 (a) identifying a plurality of geometrically arranged coordinates;  
4 (b) computing a distance value based on the geometrically arranged coordinates;  
5 and  
6 (c) calculating a LOD value using the distance value for use during computer  
7 graphics processing.
- 1 2. The method as recited in claim 1, and further comprising estimating a  
2 derivative value based on the geometrically arranged coordinates, wherein  
3 the distance value is computed based on the derivative value.
- 1 3. The method as recited in claim 2, wherein the geometrically arranged  
2 coordinates include  $(z_0, z_1, z_2, z_3)$  which are representative of a quadrilateral  
3 with  $z_0$  being an upper left corner of the quadrilateral,  $z_1$  being an upper right  
4 corner of the quadrilateral,  $z_2$  being a lower left corner of the quadrilateral,  $z_3$   
5 being a lower right corner of the quadrilateral.
- 1 4. The method as recited in claim 3, wherein the quadrilateral is a 2x2 pixel  
2 quadrilateral.
- 1 6. The method as recited in claim 3, wherein the derivative value is a derivative  
2 with respect to an x-axis.
- 1 7. The method as recited in claim 6, wherein the derivative value is calculated  
2 using the expression  $((z_1 - z_0) + (z_3 - z_2))/2$ .

1 8. The method as recited in claim 3, wherein the derivative value is a derivative  
2 with respect to an y-axis.

1 9. The method as recited in claim 8, wherein derivative value is calculated  
2 using the expression  $((z_2 - z_0) + (z_3 - z_1))/2$ .

1 10. The method as recited in claim 1, wherein the geometrically arranged  
2 coordinates are texture coordinates  $(u_0, u_1, u_2, u_3)$ .

1 11. The method as recited in claim 1, wherein the geometrically arranged  
2 coordinates are texture coordinates  $(v_0, v_1, v_2, v_3)$ .

1 12. The method as recited in claim 1, wherein the geometrically arranged  
2 coordinates are texture coordinates  $(p_0, p_1, p_2, p_3)$ .

1 13. The method as recited in claim 2, wherein the LOD value is calculated for  
2 dependent textures.

1 14. The method as recited in claim 1, wherein the LOD value is calculated for  
2 cube environment mapping.

1 15. The method as recited in claim 1, and further comprising determining if the  
2 geometrically arranged coordinates reside on separate sides of a cube map,  
3 and performing a coordinate space transform if the geometrically arranged  
4 coordinates reside on separate sides of the cube map.

1 16. The method as recited in claim 1, and further comprising determining if a  
2 sign of a q-value of a pixel associated with each coordinate is the same.

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1 17. The method as recited in claim 16, and further comprising setting the LOD  
2 value to infinity if it is determined that the sign of the q-value of each pixel is  
3 not the same.

1 18. The method as recited in claim 1, wherein the geometrically arranged  
2 coordinates include  $(z_0, z_1, z_2, z_3)$  which are representative of a quadrilateral  
3 with  $z_0$  being an upper left corner of the quadrilateral,  $z_1$  being an upper right  
4 corner of the quadrilateral,  $z_2$  being a lower left corner of the quadrilateral,  $z_3$   
5 being a lower right corner of the quadrilateral.

1 19. The method as recited in claim 18, and further comprising transforming the  
2 geometrically arranged coordinates to a different coordinate system  $(l, m, n)$ ,  
3 wherein the distance value is estimated using an expression selected from the  
4 group of  $(l_1 - l_0)^2 + (m_1 - m_0)^2 + (n_1 - n_0)^2$ ,  $(l_2 - l_0)^2 + (m_2 - m_0)^2 + (n_2 - n_0)^2$ ,  
5  $(l_3 - l_1)^2 + (m_3 - m_1)^2 + (n_3 - n_1)^2$ , and  $(l_3 - l_2)^2 + (m_3 - m_2)^2 + (n_3 - n_2)^2$ .

1 20. A computer program embodied on a computer readable medium for  
2 calculating a level of detail (LOD) value for use during computer graphics  
3 processing, comprising:  
4 (a) a code segment for identifying a plurality of geometrically arranged  
5 coordinates;  
6 (b) a code segment for computing a distance value based on the geometrically  
7 arranged coordinates; and  
8 (c) a code segment for calculating a LOD value using the distance value for use  
9 during computer graphics processing.

1 21. The computer program as recited in claim 20, and further comprising a code  
2 segment for estimating a derivative value based on the geometrically  
3 arranged coordinates, wherein the distance value is computed based on the  
4 derivative value.

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- 1 22. The computer program as recited in claim 21, wherein the geometrically  
2 arranged coordinates include  $(z_0, z_1, z_2, z_3)$  which are representative of a  
3 quadrilateral with  $z_0$  being an upper left corner of the quadrilateral,  $z_1$  being  
4 an upper right corner of the quadrilateral,  $z_2$  being a lower left corner of the  
5 quadrilateral,  $z_3$  being a lower right corner of the quadrilateral.
- 1 23. The computer program as recited in claim 22, wherein the quadrilateral is a  
2 2x2 pixel quadrilateral.
- 1 24. The computer program as recited in claim 22, wherein the derivative value is  
2 a derivative with respect to an x-axis.
- 1 25. The computer program as recited in claim 24, wherein the derivative value is  
2 calculated using the expression  $((z_1 - z_0) + (z_3 - z_2))/2$ .
- 1 26. The computer program as recited in claim 22, wherein the derivative value is  
2 a derivative with respect to an y-axis.
- 1 27. The computer program as recited in claim 26, wherein derivative value is  
2 calculated using the expression  $((z_2 - z_0) + (z_3 - z_1))/2$ .
- 1 28. The computer program as recited in claim 20, wherein the geometrically  
2 arranged coordinates are texture coordinates  $(u_0, u_1, u_2, u_3)$ .
- 1 29. The computer program as recited in claim 20, wherein the geometrically  
2 arranged coordinates are texture coordinates  $(v_0, v_1, v_2, v_3)$ .
- 1 30. The computer program as recited in claim 20, wherein the geometrically  
2 arranged coordinates are texture coordinates  $(p_0, p_1, p_2, p_3)$ .

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1 31. The computer program as recited in claim 21, wherein the LOD value is  
2 calculated for dependent textures.

1 32. The computer program as recited in claim 20, wherein the LOD value is  
2 calculated for cube environment mapping.

1     33.     The computer program as recited in claim 20, and further comprising a code  
2     segment for determining if the geometrically arranged coordinates reside on  
3     separate sides of a cube map, and a code segment for performing a coordinate  
4     space transform if the geometrically arranged coordinates reside on separate  
5     sides of the cube map.

34. The computer program as recited in claim 20, and further comprising a code segment for determining if a sign of a q-value of a pixel associated with each coordinate is the same.

1     35.     The computer program as recited in claim 34, and further comprising a code  
2             segment for setting the LOD value to infinity if it is determined that the sign  
3             of the q-value of each pixel is not the same.

1 36. The computer program as recited in claim 20, wherein the geometrically  
2 arranged coordinates include  $(z_0, z_1, z_2, z_3)$  which are representative of a  
3 quadrilateral with  $z_0$  being an upper left corner of the quadrilateral,  $z_1$  being  
4 an upper right corner of the quadrilateral,  $z_2$  being a lower left corner of the  
5 quadrilateral,  $z_3$  being a lower right corner of the quadrilateral.

1 37. The computer program as recited in claim 36, and further comprising a code  
2 segment for transforming the geometrically arranged coordinates to a  
3 different coordinate system (l,m,n), wherein the distance value is estimated  
4 using an expression selected from the group of  $(l_1 - l_0)^2 + (m_1 - m_0)^2 + (n_1 -$

5  $n_0)^2, (l_2 - l_0)^2 + (m_2 - m_0)^2 + (n_2 - n_0)^2, (l_3 - l_1)^2 + (m_3 - m_1)^2 + (n_3 - n_1)^2$ , and  $(l_3 -$   
6  $l_2)^2 + (m_3 - m_2)^2 + (n_3 - n_2)^2$ .

- 1 38. A system for calculating a level of detail (LOD) value for use during  
2 computer graphics processing, comprising:  
3 (a) logic for identifying a plurality of geometrically arranged coordinates;  
4 (b) logic for computing a distance value based on the geometrically arranged  
5 coordinates; and  
6 (c) logic for calculating a LOD value using the distance value for use during  
7 computer graphics processing.

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